COMPARISON OF NASOPHARYNGEAL (NP) SWABS COLLECTED WITH PERNASAL FLOCKED SWABS VERSUS NP SWABS COLLECTED WITH TRADITIONAL TWISTED WIRE FIBER MINITIP FOR THE DETECTION OF RESPIRATORY VIRUSES USING SIMULFLUOR DFA.

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Abstract:

Introduction: NP swabs and aspirates continue to be recommended as the specimen of choice for the detection of respiratory viruses in patients with symptoms compatible with a respiratory tract infection. The yield of NP swabs depends on the quality and quantity of respiratory epithelial cells obtained. The development of new flocked swabs capable of collecting more epithelial cells may thus result in improved sensitivity.
Objective: The objective of this study was to compare the yield of respiratory epithelial cells using Copan flocked NP swabs placed in Starplex Multitrans S160 medium to that using traditional twisted wire fiber minitip swabs.
Methods: Patients with a suspected viral respiratory tract infection had a NP swab collected using either the Copan flocked swab or the twisted wire swab and submitted to the microbiology lab for processing. The type of swab collected was random and each patient had only one swab collected as per routine procedure. In the lab, the swabs were used to make 2 cytospin direct smears for DFA (1 stained with Chemicon SimulFluor Respiratory virus Screen and one stained with SimulFluor Flu A/Flu B) and then, if sufficient material was available, inoculated into an R-Mix shell vial +/- an R-Mix TOO shell vial (Diagnostic Hybrids, USA) if the DFA was positive for Flu A/Flu B. R-Mix shell vials were incubated for 48 hours before staining with Millipore (Chemicon) SimulFluor reagents.
Results: A total of 269 flocked swabs and 159 wire swabs were collected between November 2007 and February 2008. The yield of respiratory epithelial cells was substantially greater with the flocked swab vs the wire swab. The detection of respiratory viruses was as follows:

	DFA and/or Culture	DFA	Culture
Flocked swabs (N)	269	269	230
•#Positive	45	35	40
•% Positive	16.7%	13.0%	17.4%
Wire swabs (N)	159	159	123
•# Positive	26	20	22
•% Positive	16.4%	12.6%	17.9%

Conclusions: The Copan flocked swabs yielded more, as well as better quality respiratory epithelial cells which made the reading and interpretation of the DFA much easier. The Millipore DFA reagent produced good clarity and well defined fluorescence even in the case of low positive samples. Those collecting swabs preferred the flocked swab because it was easier to break the shaft when placing it in the transport medium compared to the need to cut the shaft of the wire swab. However, the yield of respiratory viruses did not differ between the two swabs. This may be due to the fact that different patients were being tested (i.e. no patient had both swabs collected) and thus we could only determine the overall positivity rate using each swab. As well, the number of swabs collected may have been too small to detect a difference.

Introduction

Detection of respiratory viruses depends heavily on proper specimen collection. Improperly collected samples may yield misleading or no result at all. Due to their relative ease of collection and efficient virus recovery, nasopharyngeal (NP) swabs remain one of the most recommended specimens for the detection of respiratory viruses. When collecting an NP swab, one must ensure that the swab is inserted at least 5-6 cm into the nasal cavity (Figure 1) to ensure one is not simply collecting material from the anterior nares. The shaft of the swab must be flexible to allow for the curvature of the anatomy. Recent introduction of flocked swabs, with perpendicularly arranged nylon fibers (Figures 2&3), have the potential to further improve detection sensitivities by gathering more epithelial cells, absorbing more liquid via capillary action and yet releasing those materials more easily than previous woven fiber designs.

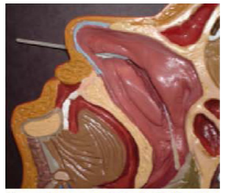

Figure 1. Nasopharyngeal Swab Collection

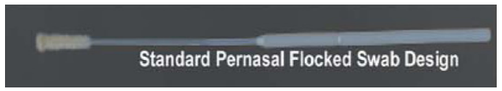

Figure 2. Flocked Swab with Molded Break Point

Figure 3. Flocked Swab with Perpendicular Nylon Fibers

Objectives

To compare the performance and yield of flocked NP swabs in Multitrans S160 transport medium to that using twisted wire mini-tip rayon swabs in Multitrans S160 transport medium.

Methods

This was a prospective and randomized study in which both flocked and wire swabs were supplied to several hospitals with populations ranging from pediatric to geriatric.
Instructions were given to alternate between the two swab types.
Patients with a suspected viral respiratory tract infection had one NP swab collected using either the flocked swab (microRheologics, Copan Italia, Brescia, Italy) or the twisted wire minitip rayon swab and submitted to the microbiology lab for processing as per routine procedure. When swabs were received in the lab, the type of swab was recorded. The specimen tubes containing the swabs were vortexed and then centrifuged. The deposit was used to create two cytospin direct smears for DFA, one stained with SimulFluor Respiratory Screen Kit (Millipore Chemicon Light Diagnostics, Temecula, California) and the other one stained with SimulFluor Flu A/Flu B. The supernatant fluid was used to inoculate an R-Mix shell vial and, if the DFA is positive, an additional R-Mix TOO shell vial (Diagnostic Hybrids, Athens, Ohio). The shell vials were incubated for 48 hours before staining with SimulFluor reagents.
Cytospin cell smears prepared with both swabs were graded for cell numbers. DFA readings at 200x magnification were recorded (Figure 4):

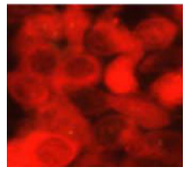

Figure 4. Respiratory Epithelial Cells in a DFA Smear

Results

A total of 635 NP swabs (352 flocked swabs and 283 wire swabs) were collected between November 2007 and March 2008. The yield of respiratory epithelial cells (Figure 4) was substantially greater with the flocked swabs compared to the wire swabs (Figure 5).
Table 1 shows the yields of both DFA and Culture from the two types of swabs. The yield from flocked swabs was slightly higher. All swabs had DFA done but cultures for some were not performed due to insufficient volumes.
Table 2 shows the types of respiratory viruses detected and the numbers and percentages from each type of swabs.

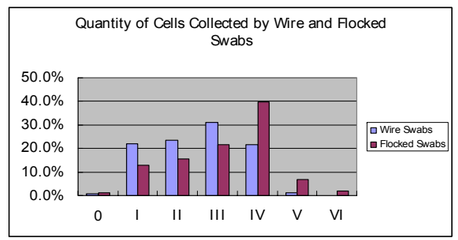

Figure 5. Quantity of Cells Collected by Wire and Flocked Swabs

	DFA and/or Culture	DFA	Culture
Flocked Swabs (N)	352	352	313
#Positive	62	42	56
% Positive	18%	12%	18%
Wire swabs (N)	283	283	247
#Positive	41	30	35
% Positive	14%	11%	14%

Table 1. Yields of DFA and Culture

	Adenovirus	Influenza A	Influenza B	Parainfluenza 1	Para 2	Para 3	RSV	Positive, not identified	Total Pos	DFA or Culture
#Flocked Swabs positive	2	24	6	1	0	0	25	4	62	352
%Flocked Swabs positive	1%	7%	2%	0%	0%	0%	7%	1%	18%	100%
#Wire Swabs positive	0	9	2	0	0	0	28	2	41	283
%Wire Swabs positive	0%	3%	1%	0%	0%	0%	10%	1%	14%	100%

Table 2. Types and Distribution of Respiratory Viruses Detected with SimulFluor DFA Reagents

Discussions

The design of the study allowed routine procedures to take place in specimen collection, lab processing and materials procurement: Patients were not subjected to additional discomfort of duplicate sampling, routine clinical and lab staff did not perform extra work during a busy respiratory season and no additional reagents or other supplies were consumed as a result of the study.
Collecting personnel preferred the Flocked swabs because the markings of the Flocked swabs' shaft gave visual indications how far they had to insert the swabs to reach the nasopharyngeal area. When placing the swabs in the transport medium, the Flocked swabs had notched shafts designed to break off easily. The Wire swabs required cutting with scissors and disposing them in sharps containers.
Lab personnel preferred the Flocked swabs because some Wire swabs arrived with the entire wire shaft and lid forced into the transport medium tube, making lab processing impossible without first removing the obstructing lid and excess wire shaft. Personnel reading the direct DFA preferred smears with higher numbers of cells that would make interpretation easier.
The yield from flocked swabs was slightly higher than wire swabs (17.6% vs 14.5% positivity) but the difference may not be significant. More samples are needed to establish its significance.

Conclusions

The flocked swab was a significant improvement over the wire swab with respect to the number of epithelial cells , ease of use and were preferred by both clinical and lab staff.
The flocked swabs yielded more respiratory epithelial cells which made the reading and interpretation of the DFA much easier.
The yield of respiratory viruses in culture was somewhat higher in flocked swabs than in wire swabs. A larger study is needed to determine if the difference is significant.
The Millipore DFA reagent produced good clarity and well defined fluorescence even in the case of low positive samples, its dual fluorescence allowed for further virus identification with less cellular materials.